

**GUIDELINES FOR DEVELOPING
AN
EMERGENCY ACTION PLAN**

New Jersey
Department of Environmental Protection
Dam Safety
Trenton, NJ 08625

**May 1996
Revised May 2002**

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Standardized Format and Text for an Emergency Action Plan

Attachment B

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Introduction

The New Jersey Dam Safety Standards (N.J.A.C. 7:20 et seq.) require that owners of Class I and Class II dams develop and maintain an Emergency Action Plan (EAP) for use in the event of a dam failure or the uncontrolled release of stored water. Guidelines for Developing an Emergency Action Plan was developed to assist dam owners in the preparation of an EAP. It is the responsibility of each Class I and Class II dam owner to develop an EAP tailored to his or her respective dam.

In an effort to further assist the owners of smaller Class I and Class II dams, a standardized EAP format and text (Attachment A - Standardized Format and Text for an EAP) has been provided. Please keep in mind, however, that since an EAP is useful only if it accurately reflects site conditions, some modifications to the standardized text may occasionally be required. Accordingly, the standardized format should be used with care. Authorization to use the standardized EAP format and text will be provided by the New Jersey Department of Environmental Protection, Dam Safety Section (NJ-DSS) on a case-by-case basis. For larger dams, the standardized format may not be applicable since there are often additional requirements and considerations which need to be addressed. For clarity, the requirements that pertain only to the larger dams have been written in italics and bolded thus: ***EAPs for Class I large dams as specified in N.J.A.C. 7:20-1 et seq. will be coordinated with New Jersey State Police, Office of Emergency Management (NJ-OEM). For large dams, a meeting should be conducted with the NJ-DSS prior to starting on the EAP development.***

An electronic version (Microsoft Word) of the text portion of the EAP must be submitted to the Department. All of the local road maps, dam location maps, dam drawings and tables must be in the document. Please submit the EAP in a three ringed binder sized correctly for the amount of material in the document.

Instructions

The Standardized Format and Text for an EAP (Attachment A) has been divided into eight (8) sections with **the cover page and emergency notification section color coded for ease of use**. The following is a text outline with instructions:

Cover Page of the EAP must include the name of the dam, the New Jersey file number, the name and address of the owner/operator, the name and address of the person/entity preparing the document, the date the document was prepared along with any revision dates, and the document number. Since each dam must have its own EAP with its own specific procedures to be followed, title pages or cover sheets are essential so personnel can be sure they are using the correct EAP for the circumstances.

Table of Contents should outline the information contained in the EAP.

I. Emergency Notification

Emergency Notification Flowchart. The emergency notification flowchart should include individual names, office, and 24-hour telephone numbers. The number of persons to be notified by each individual on the notification flowchart should be governed by what other responsibilities the person has been assigned. It is recommended that no individual be responsible for contacting more than three or four other parties.

The notification list should contain the following:

- Dam owner.
- Local emergency management officials and related organizations.
- Appropriate state emergency management agencies.
- Residents and property owners that are located immediately downstream of the dam within the boundary of potential inundation where available warning time is limited.
- Operators of other dams or water-retention facilities which may affect or be affected by an emergency.
- Others, as appropriate.

Although the list may not be all inclusive or represent a prioritization of those entities listed, the author of the EAP should understand that the dam owner and emergency management authorities are typically given top priority.

The Emergency Notification Flowchart should be easy to follow for each emergency condition level (see Section IV). Although one flowchart that represents all levels is preferred, for clarity, it may be necessary to develop a flowchart for each condition level. Narrative information supplementing the flowchart may be provided on the page following the flowchart. Copies of the flowchart should be readily available to each individual having responsibilities under the plan and should be kept up-to-date through exercises and revisions.

For large dams, separate notification flowcharts should be provided for each emergency condition. Not all entities may need to be notified for a dam advisory or warning condition.

Emergency Notification Information. Following the Emergency Notification Flowchart is a Notification Information form which should be utilized if an emergency condition is identified.

This form is intended to aid the person reporting the emergency condition in relating all pertinent information.

II. Statement of Purpose

Outline the **Purpose**, **Scope** and **Authority** under which the EAP is being prepared.

III. Project Description

Project Site Description. Provide a description of the project and its location. Include a project vicinity map and a drawing showing project features. List any significant upstream or downstream dams. List downstream communities which would potentially be affected by a dam failure or by flooding resulting from abnormal operational releases.

IV. Emergency Detection, Evaluation, and Classification

The EAP document should include a discussion of procedures for timely and reliable detection, evaluation, and classification of an existing or potential emergency condition.

The conditions, events or measures for detection of an existing or potential emergency should be listed. Procedures, aids, instruction, and provisions for evaluation of information and data to assess the severity and magnitude of any existing or potential emergency should be discussed.

Emergencies are classified according to their severity and urgency. An emergency classification system is one method to classify emergency events according to the different times at which they occur and to their varying levels of severity. The classification system indicates the urgency of the emergency condition.

Titles for emergency classifications have been chosen carefully in cooperation with the NJ-OEM so that everyone will understand what each classification level means when notifications are issued and received. The following four (4) emergency classifications are provided: Advisory Condition, Warning Condition, Emergency Condition, and Breach Condition. ***In addition, for Class I Large Dams, an additional classification, Non-Failure Emergency Condition, is provided.***

Dam Advisory Condition is a situation where an unusual problem or situation has occurred, but a failure of the dam is not imminent. All appropriate parties should be notified periodically with regard to status and should be on stand-by for emergency actions should conditions deteriorate.

Dam Warning Condition is a situation or circumstance which may affect the integrity of the dam but is considered controllable. This condition may lead to a failure of the dam. All appropriate parties should be notified periodically with regard to status and should be on stand-by for emergency actions should conditions deteriorate.

Dam Emergency Condition is a situation where the dam is being overtopped or rapid deterioration is occurring. A failure may eventually occur; however, pre-planned actions taken during certain events (major floods, earthquakes, evidence of piping, etc.) may

moderate or alleviate failure. Even if failure is inevitable, more time is generally available than in a Dam Breach Condition to issue warnings and/or take preparedness actions. All appropriate parties should be notified to commence their emergency operations and evacuation (if necessary).

Dam Breach Condition is a situation where the dam is failing. Dam failure is imminent and there is no longer any time available to attempt corrective measures. All appropriate parties should be notified to commence emergency operations and evacuation.

Dam Non-failure Emergency Condition applies to Class I Large Dams and is a situation in which there may be no apparent threat to the integrity of the dam; however, an unusually large release at the dam, due to a gate malfunctioning or other unforeseen event, could cause downstream flooding. All appropriate parties should be notified to commence their emergency operation and evacuation (if necessary).

V. General Responsibilities Under the EAP

Dam Owner Responsibilities. The duties of the dam owner or owners designated representatives under the EAP should be clearly described. The operator should be advised of the importance of the EAP and why the EAP is necessary. The operators duties under the EAP should be described in detail. Specific actions that the operator is to take after implementing the EAP notification procedures should be described. Instructions for the operation of the dam during the anticipated emergency should be provided. The person responsible for notification and for periodic updates should be identified.

Responsibility for Notification. The person(s) authorized to notify local officials should be determined and clearly identified in the EAP. If time allows in an emergency situation, onsite personnel should seek advice and assistance. However, under certain circumstances, such as when failure is imminent or has occurred, the responsibility and authority for notification may have to be delegated to the dam operator or a local official. Such situations should be specified in the EAP. The person who is responsible for disseminating information to the media and the public on a periodic basis throughout the emergency should be designated. Also, a means to keep local authorities advised of developing conditions at the dam should be described.

EAP Coordinator Responsibilities. The dam owner should specify in the EAP the designated EAP coordinator who will be responsible for EAP related activities, including (but not limited to) the preparation of required revisions to the EAP, the establishment of training seminars, the coordination of EAP exercises, etc. This person will be the EAP contact if any involved parties have questions concerning the EAP.

Responsibility for Evacuation. Warning and evacuation planning are the responsibilities of local authorities who have the statutory obligation. Under the EAP, the dam owner is responsible for notifying the appropriate emergency management officials when flooding is anticipated or a failure is imminent or has occurred. Dam owners should not assume the

responsibility of government entities for evacuation. However, there may be situations in which routine notification and evacuation will not suffice, as in the case of a resident located just below the dam. In this case, the dam owner should arrange to notify that person directly.

This procedure should be coordinated with the appropriate public officials prior to the development of an emergency situation.

Responsibility for Termination and Recovery. An owners representative should be designated for monitoring the situation at the dam and keeping local authorities informed of developing conditions at the dam from the time that an emergency starts until the emergency has been terminated. This person should be responsible for declaring that the emergency at the dam is terminated in coordination with the NJ-DSS. The applicable state or local emergency management officials are responsible for termination of the disaster response activities. A follow-up evaluation after an emergency by all participants should be specified. The results of the evaluation must be documented in a written report by the dam owner. Provisions for security measures at the dam during the emergency should be specified.

VI. Preparedness

Preparedness actions are taken to help reduce or eliminate the effects of a dam failure or abnormal operational releases and to facilitate response to emergencies. A few of the preparedness actions that a dam owner may take include providing emergency flood operating instructions and arranging for equipment, labor, and materials for use in emergency situations.

The EAP should describe preparedness actions taken both prior to and following the onset of emergency conditions. Preparedness actions involve the installation of equipment or the establishment of procedures for one or more of the following purposes:

- Preventing emergency conditions from developing or warning of the onset of emergency situations.
- Facilitating the operation of the dam in an emergency situation.
- Minimizing the extent of damage resulting from any emergency situations that do develop.

The need for timely action in an emergency situation cannot be overemphasized. The EAP should contain a discussion of provisions for surveillance and evaluation of an emergency situation and should clearly indicate that emergency response procedures can be implemented in a timely manner. An important factor in the effectiveness of the EAP is the prompt detection and evaluation of information obtained from instrumentation and/or physical inspection procedures.

There are several types of preparedness actions that should be considered when developing an EAP. These actions include:

- Surveillance.
- Response during adverse times such as darkness, weekends, holidays and bad weather.
- Access to the site.
- Alternative systems of communication.
- Emergency supplies and information.

Emergency Notification Directory. The EAP should contain a list of all pertinent personnel and response authorities with their business and home phone numbers.

Emergency Operations Center (EOC). The EOC is the location where personnel will be coordinated and updated during an emergency. The location and directions to the owners EOC from the nearest State or County highway should be provided. The EOC should be located upstream of the dam away from any potential inundation area. A sample EOC location map is enclosed as Attachment B.

Surveillance. The EAP should contain a provision for surveillance, detection and evaluation of an emergency situation. When a dam is not continuously attended and dam failure or abnormal operational releases would endanger human life or cause significant property damage, it is imperative that procedures be developed to identify conditions requiring emergency action and to promptly alert emergency management officials responsible for warning and evacuation. In order to be able to promptly notify responsible officials of emergency conditions, a dam owner must be able to detect and evaluate developing emergency conditions.

Emergency Supplies and Information. There are certain planning and organizational measures that can help the dam owner and local officials manage an emergency situation more safely and effectively. These measures include stockpiling materials and equipment for emergency use and the dissemination of relevant information. Also, alternative sources of power for spillway gate operation and other emergency uses should be provided.

Other Site Specific Actions. Describe any other site-specific actions devised to moderate or alleviate the extent of potential emergencies.

VII. Inundation Maps

Inundation maps are necessary and should be developed by the dam owner in coordination with the appropriate State and local emergency management agencies. Since those agencies will rely heavily on the inundation maps during an emergency, it is important that they contain information required by those agencies. Inundation mapping criteria required for dams:

- The inundation map should be developed at a scale sufficient to be used for identifying downstream inhabited areas subject to possible danger. Potential inundation areas should be clearly identified. It may be appropriate to supplement the inundation maps with water surface profiles showing the elevation prior to failure, the peak water surface elevation after failure, and the elevation of structures at critical locations. Inundation maps should be a foldout preferably no larger than 11"x17" in size.
- The inundation map must also be submitted in an ArcView compatible format. This includes Computer Aided Design drawings (.DWG and .DXF formats) and ArcView shape (.SHP format). The inundation line for the sunny day, spillway design flood (SDF) and the SDF with

failure should each be in a separate layer (.DXF or .DWG) or all three lines submitted as one theme (.SHP). The submitted files must be geo-referenced using the New Jersey State plane coordinates (SPC) in North American Datum 1983 (Nad83). Also, the data submitted must be in compliance with the NJDEP Digital Data Standards. The base maps to be used when plotting the inundation line are the 1995 orthophotos 1:12000 JPEG. Please do not submit the base maps; only the inundation line should be submitted to the Department.

- County and Municipal boundaries should be indicated.
- Inundation areas should be clearly marked for sunny day failure, design storm, and design storm with failure.
- The following should be reflected on the map (or on an accompanying data chart) at each municipal boundary line:
 - Distance downstream from the dam to the nearest tenth of a mile.
 - Time of arrival of the first flood waters at that point. The time should be reflected in hours and minutes.
 - Time of arrival of the peak flood level at that point. The time should be reflected in hours and minutes.
 - Depth of water measured from bottom of stream bed to the maximum inundation elevation along with the corresponding flow rate.

For smaller Class I and Class II dams, some of the requirements will be at the discretion of the NJ-DSS and may be modified on a case by case basis. A sample inundation mapping is enclosed as Attachment D.

A dam breach analysis performed by a New Jersey licensed professional engineer using methods approved by the NJ-DSS will be required to identify potential inundation areas. Prior to proceeding with the dam breach analyses and inundation mapping, the owner/operators engineer should contact NJ-DSS. Guidance for performing a breach analysis is enclosed as Attachment E.

A narrative description of the areas affected by the dam break may be included to clarify unusual conditions. The narrative should describe the specific area threatened and include information on the extent of expected flooding relating it to known landmarks and historical flood heights. Whenever possible, major streets, railroads, and other well known features should be indicated.

The map lines delineating the potential inundation areas should be drawn in such thickness or form (solid line, dashed line, dotted line) to identify the inundation limits as the main feature of the map but not obliterate the location of houses or features which are to be shown as being inundated. Clarity is important. When plotting inundation limits between cross sections used for analysis, the lines should reasonably reflect the change in water levels with consideration given to topographic patterns and both natural and man made features. When inundation lines enter the area of an existing lake or reservoir, they should be drawn to represent an increase in the water level of the lake or reservoir. Should this increased water level overtop the downstream dam, the appropriate inundation lines should be drawn below this dam in order to represent expected inundation to the point where an increase in water level will no longer represent danger to life or property. The area between the inundation lines representing the

water level may be shaded to distinguish the area of inundation. Care should be taken to select a shading which will not obliterate the background information shown on the map.

The accuracy and limitation of the information supplied on the inundation maps and how best to use the maps should be described. Since local officials are likely to use the maps for evacuation purposes, a note should be included on the map to advise that, because of the method, procedures, and assumptions used to develop the flooded areas, the limits of flooding shown and flood wave travel times are approximate and should be used only as a guideline for establishing evacuation zones. Actual areas inundated will depend on actual failure or flooding conditions and may differ from areas shown on the maps. The owner should review the inundation maps with the local jurisdictions and resolve any problems.

If inundation maps are to be shown on several pages, a map index should be included to orient the individual pages.

Inundation maps should be updated periodically to reflect changes in downstream areas and should include any pertinent information resulting from coordination with appropriate emergency management authorities.

VIII. Appendices

Following the main body of the EAP, an appendix section should be included that contains information that supports and supplements the basic EAP.

Appendix A - Plans for Training, Exercising, Updating and Posting

Training - Training of personnel involved in implementation of the EAP should be conducted to ensure that they are thoroughly familiar with all elements of the plan, the availability of equipment, and their responsibilities and duties under the plan. Technically qualified personnel should be trained in problem detection and evaluation and appropriate remedial (emergency and non-emergency) measures. This training is essential for proper evaluation of developing situations at all levels of responsibility which, initially, is usually based upon onsite observations. A sufficient number of people should be trained to ensure adequate coverage at all times. A training plan should be included in the appendix to the EAP. Exercises simulating emergency conditions are excellent mechanisms for ensuring readiness. Cross-training in more than one responsible position for each individual is advisable in order to provide alternates. A careful record by roster should be kept of training completed and refresher training conducted.

Exercising - Prepare scenarios for the various emergency conditions and test the state of training and readiness of key personnel responsible for actions during an emergency to guarantee an understanding of the procedures to be followed and actions required. Any special procedures required for nights, weekends, and holidays should be included. The

exercises should involve an annual drill and periodic comprehensive (functional or full-scale) exercises. Testing of remote sensing equipment at unattended dams should be included. Coordination and consultation with state and local emergency management officials and other organizations when developing a comprehensive EAP exercise program is important in order to enhance realism. Their involvement will help perfect the close coordination necessary for a successful execution of emergency procedures during an actual emergency. The exercises should include participation by both the dam owner and the affected state and local emergency management officials. The exercises should be discussed, evaluated and the findings and conclusions memorialized. The EAP should be revised to correct any deficiencies noted. The exercises range from simple to complex and from low to high realism. The four standardized types of exercises include Drill, Tabletop, Functional, and Full Scale. The following is a brief discussion of each:

Drill - A Drill is the lowest level exercise that involves an actual test and has the following components and characteristics:

- Tests, develops, or maintains skill in a single response procedure.
- Usually is an in-house test.
- Is part of on-going training.

Tabletop - A Tabletop exercise has the following components and characteristics:

- Higher level exercise than a drill.
- Involves various levels of personnel.
- Is held in an informal conference room environment.
- Low stress, no time constraints.
- Actions are taken and discussion is based on a described emergency situation, plus a series of messages to participants.
- Provides an opportunity to discuss the EAP and response procedures, and to resolve questions throughout the exercise.
- Allows for the practice of problem-solving for emergency situation.
- Participants practice a coordinated, effective response.

Functional - A Functional exercise has the following components and characteristics:

- Involves various levels of personnel without full activation of field personnel.
- Simulates emergency operations center environment.
- Stressful, with time constraints.
- Simulates dam failure and response.
- Participants ? act out? their roles.
- Tests both dam owner and agency responses, including coordination.

Full Scale - A Full Scale exercise has the following components and characteristics:

- Interactive, stressful, with time constraints.
- Actual mobilization of personnel and resources.
- Adds a field component that interacts with a functional exercise through simulated messages.
- Tests deployment capabilities.

Updating - A regular review of the adequacy of the EAP should be conducted at intervals not to exceed one year. The review should include the flood inundation area, downstream development, the reservoir, and the EAP text. The review should determine whether any revisions to the current EAP are necessary. If, as a result of the annual review, no revisions are necessary, a written statement to this effect should be provided to each recipient of the original EAP. The EAP should be updated promptly when changes are required. EAP personnel or telephone number changes should be recorded as they occur.

Posting of the Notification Flowchart - An up-to-date copy of the Notification Flowchart should be posted in prominent locations at the dam site and local emergency operation centers (essential for unattended dams). The flowchart should be posted at each phone and radio transmitter at the dam, powerhouse (if applicable), and at all other desirable locations. The locations of the posted flowcharts should be indicated in the EAP.

Appendix B - Definitions

Definitions section for those people not familiar with the terms used in the EAP.

Appendix C - Approval and Distribution of the EAP

Once the EAP has been developed, the owner/operator shall submit the completed EAP with inundation mapping and dam breach analyses to the NJ-DSS for review and approval.

Once the NJ-DSS approves the EAP, the EAP must be distributed by the owner to all individuals who will be involved during an emergency. Any revisions to the EAP should be furnished to all individuals to whom the original EAP was distributed. Each party receiving an EAP must sign and return a receipt to the distributor (owner/operator) of the EAP. The signed receipt should help to assure that all parties are aware of and understand the EAP and agree to their assigned roles should an emergency occur. A standard distribution letter and receipt are included for reference in the standardized format.

Attachment A

**STANDARDIZED FORMAT AND TEXT
FOR AN
EMERGENCY ACTION PLAN**

EMERGENCY ACTION PLAN

For

_____ Dam

NJ File Number: _____

Owner/Operator: _____

Address: _____

Prepared By: _____

Address: _____

Date: _____

Revision Dates:*

1st Revision: _____

2nd Revision: _____

3rd Revision: _____

*** THE DAM OWNER/OPERATOR IS RESPONSIBLE FOR THE ANNUAL REVIEW AND UPDATING OF THE EAP.**

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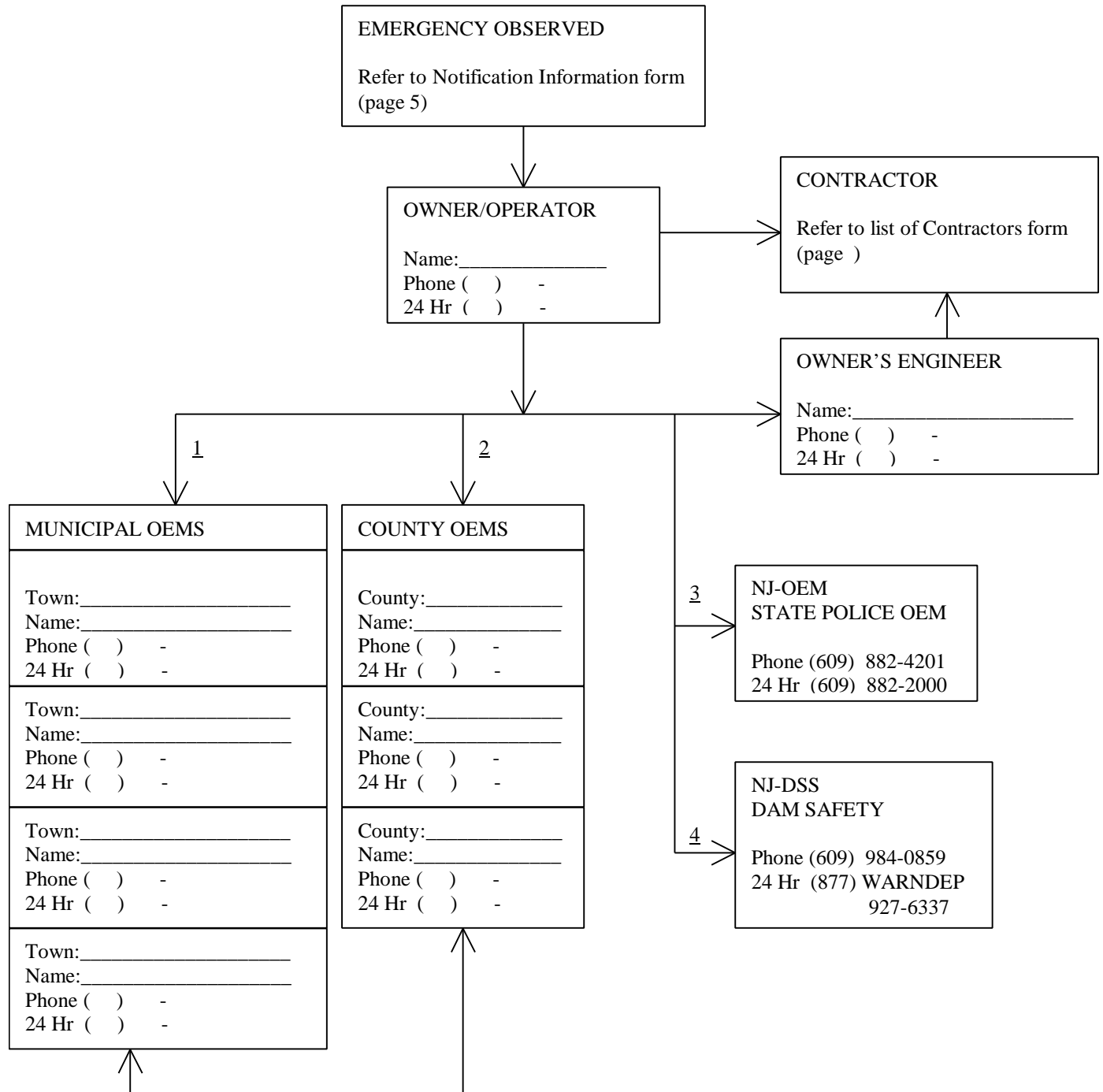
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EMERGENCY NOTIFICATION FLOWCHART



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I. Emergency Notification

Emergency Notification Information

Dam emergency information for the four emergency conditions

Name of person reporting the emergency: _____

Affiliation: _____

Phone Number: _____

Name & file number of dam: _____

Location of dam

County: _____

Municipality: _____

Stream: _____

Road(s): _____

Time and date of dam emergency: _____

Type of emergency: _____

Phone appropriate parties: *[refer to the Emergency Notifications Flow Chart, page 4]*

"This is (your name, title & affiliation).

There is a Dam (Advisory, Warning, Emergency, or Breach) condition at (name of dam).

Observation was at (time).

The situation is (explain the condition).

What is your anticipated time of arrival at the dam and what are my instructions?"

[refer to Site Description, page 7, for directions to the dam]

Communication priority list:

1. Municipal OEM.
2. County OEM.
3. NJ-OEM.
4. NJ-DSS.
5. Owner's Engineer.

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II. Statement of Purpose

Purpose

To establish procedures necessary to protect life and property in areas affected by the failure of a dam or the uncontrolled release of stored water.

Scope

This Emergency Action Plan:

1. Establishes a monitoring system which can activate the Plan.
2. Identifies the officials, organizations, agencies, and their respective responsibilities for implementing the plan.
3. Identifies those areas, residences, facilities and roads which might be affected by a dam failure.

Authority

1. Public Law 1942, Chapter 251, as amended.
2. N.J.S.A. 58:4-1 et seq., Safe Dam Act.
3. N.J.A.C. 7:20-1 et seq., Dam Safety Standards.

III. Project Description

Project Site Description

Dam Name: _____ Hazard Classification: _____

NJ File No: _____ NJ Federal Id: NJ _____

City/Town: _____ County: _____

Location & Access (provide a location map & directions to the dam from a major highway):

Lot No: _____ Block No: _____

Latitude: _____ Longitude: _____

River/Stream: _____

Quad Sheet: _____ Nearest City/Town: _____

Height (ft): _____ Normal Surface (ac): _____

Length (ft): _____ Normal Capacity (ac-ft): _____

Dam Type: _____ Maximum Capacity (ac-ft): _____

Spillway: _____ Spillway Capacity (cfs): _____

Dike: _____ Drainage Area (sqr mls): _____

Outlet other than spillway: _____

Purpose/Operation of Dam (attach additional sheets if necessary): _____

Instrumentation (if any): _____

Significant upstream or downstream dams (if any): _____

Overview of Inundation Area: _____

Method of emergency drawdown: _____

Method of emergency drawdown: _____

***PROVIDE/ATTACH PROJECT SITE DRAWINGS.**

IV. Emergency Detection, Evaluation, and Classification

Emergency Condition Identification

Since the goal of dam emergency planning is to protect lives and property, the timely identification of emergency conditions by trained personnel becomes paramount. Procedures to identify emergency conditions have been established by NJ-OEM. Four (4) dam emergency conditions of varying severity have been identified and are described below.

Dam Advisory Condition

A Dam Advisory Condition is a situation where an unusual problem or situation has occurred, but a failure of the dam is not imminent. Examples of a Dam Advisory Condition are:

- Instrumentation readings reach pre-determined numerical limits.
- Any undocumented or unusual spring.
- Any sign of piping.
- Any sign of slumping.
- Any sinkhole.
- Any unusual crack.
- Any unusual wet spot or boggy area.
- Any seismic event regardless of how slight.
- Any obstruction in the spillway.
- Evidence of damage due to vandalism at any structure(s).
- Bomb threat.
- A civil disorder near the reservoir structure(s).
- Any aircraft accident near the reservoir structure(s).

Required responses are: *[refer to Emergency Notification Flow Chart, page 4]*

- Notify municipal OEM.
- Notify county OEM.
- Notify NJ-OEM.
- Notify NJ-DSS.
- Investigation.
- Assessment and response.

Dam Warning Condition

A Dam Warning Condition is any developing or occurring event or circumstance which is or may adversely affect the integrity of the dam but is considered controllable. The Dam Warning Condition has the potential of evolving into a Dam Emergency or a Dam Breach condition.

Examples of a Dam Warning Condition are:

- Water level of the lake is at an unsafe level and is rising threatening to overtop the dam.
- Any developing erosion, settlement or upheaval occurring on the downstream slope or at the toe of the dam and is considered to be controllable.
- Any undocumented leakage through any dam structure considered to be controllable.

IV. Emergency Detection, Evaluation, and Classification

Required responses are: *[refer to Emergency Notification Flow Chart, page 4]*

- Notify municipal OEM.
- Notify county OEM.
- Notify NJ-OEM.
- Notify NJ-DSS.
- Investigation.
- Assessment and response.

Dam Emergency Condition

A Dam Emergency Condition is defined as one or more of the following situations:

- Water has overtopped or will overtop any dam or dike.
- Any uncontrollable erosion, settlement or upheaval occurring on the downstream slope or at the toe of the dam.
- Any uncontrollable leakage through any dam structure.

Required responses are: *[refer to Emergency Notification Flow Chart, page 4]*

- Notify municipal OEM.
- Notify county OEM.
- Notify NJ-OEM.
- Notify NJ-DSS.
- Commence emergency actions.
- Issue public warning and begin evacuation.

Dam Breach Condition

A Dam Breach Condition is defined as:

- A dislocation or failure of any structure which allows for an expanding, uncontrollable discharge of water through the spillway, dam or dikes indicating a breach is occurring.

Required responses are: *[refer to Emergency Notification Flow Chart, page 4]*

- Notify municipal OEM.
- Notify county OEM.
- Notify NJ-OEM.
- Notify NJ-DSS.
- Commence emergency actions.
- Issue public warning and begin evacuation.

V. General Responsibilities Under the EAP

Dam Owner/Operator Responsibilities:

During an emergency condition:

1. Identification of the emergency condition.
2. Notification of the Office of Emergency Management (OEMs) and New Jersey Department of Environmental Protection, Dam Safety Section (NJ-DSS). *[refer to the Emergency Notification Flow Chart on page 4]*

Person responsible for the notification: _____

3. Implementation and direction of emergency repairs.
4. Update the emergency status to the OEMs and NJ-DSS.

Person responsible for the updates: _____

5. Provisions for security measures at the dam.
6. Provision of technical assistance to OEM officials, when necessary.
7. Reporting termination of emergency situation on-site at the dam.

In non-emergency conditions, owner/operator must also provide for:

8. Routine maintenance and operations of the dam.
9. Routine surveillance of the dam.
10. Routine inspection of the dam.
11. Annual review, updating, and distribution of the EAP.

Owner/Operators EAP Coordinator Responsibility

Once the dam owner/operator has designated an EAP Coordinator, that person shall be responsible for EAP related activities including:

1. Inclusion and distribution of document revisions.
2. Establish training seminars.
3. Coordinate EAP exercises.
4. Contact person for any EAP related inquiries.

EAP Coordinator Name: _____

Phone Number: _____

Municipal OEM Responsibilities:

1. Warn the public of emergency conditions at the dam.
2. Implement and direct required evacuations of threatened areas.
3. Establish reception centers for evacuated people.
4. Secure and control access to evacuated areas.
5. Conduct rescue and recovery operations as required.
6. Determination and declaration of termination of an emergency/disaster response activities off-site.

County OEM Responsibilities:

1. Pass warning of emergency conditions at the dam to all affected municipalities.
2. Provide assistance to municipalities to help fulfill the emergency responsibilities.

V. General Responsibilities Under the EAP

NJ-OEM Responsibilities:

1. Assumption of control and coordination (when appropriate) of all emergency actions in accordance with Public Law.
2. Provision of assistance to the affected municipalities and counties (when requested and beyond their capabilities).
3. Coordination of specialized assistance.
4. Notification of appropriate State agencies.
5. Notification of appropriate counties of any declared emergency condition.
6. Periodic testing of the emergency notification procedures.

NJ-DSS Responsibilities:

1. Provide technical assistance to the dam owner/operator.
2. Assist in the evaluation and resolution of potential emergency conditions.
3. Has the authority to direct the owner/operator to take necessary safety measures.

Termination

The **owner/operator** is responsible for evaluating a declared emergency condition. The NJ-DSS is responsible for making the decision, when appropriate, that an emergency condition no longer exists on-site at the Dam. The Office of Emergency Management representatives (OEMs) are responsible for declaring termination of an emergency condition off-site. As such, it will be the responsibility of the owner/operator to notify the OEMs of an emergency condition termination promptly.

As part of the termination phase, the **County/Municipal OEM** will be responsible to conduct a critique of the overall emergency response and to prepare a report documenting emergency procedures and actions. The critique process will be a discussion of the events that occurred prior to, during, and after a dam emergency. Participants review and evaluate their particular actions. The purpose of the critique is to determine what, if any, practicable improvements could be made for potential future emergencies, and conversely to identify deficiencies in procedures, manpower, materials and equipment. A report will be prepared and submitted to the NJ-OEM and NJ-DSS.

Recovery

The basic goal of the recovery phase is to demobilize and return to the pre-emergency situation. The **owner/operator** is responsible for implementing all actions necessary to achieve this goal on-site at the dam. The Emergency Management Service (EMS) has the responsibility to effectuate recovery off-site in the affected communities.

The Owner/Operator is responsible for directing all on-site recovery activities. The basic recovery actions common to the four dam emergency conditions are:

- Secure access to emergency site,
- Restore basic facilities and services, and
- Assess damage.

V. General Responsibilities Under the EAP

An additional activity that could be part of a high level dam emergency with associated physical actions would be a disaster declaration. Official disaster declarations would be made by members of the EMS, not by the owner of the dam.

A damage assessment report will be prepared by the owner to quantify the economic damages and to evaluate the impacts to the dam structure or the lake. Damage assessment will be done in two stages. The first stage will estimate the overall impacts in a broad sense and will be prepared as soon as possible following the dam emergency. The second stage will be a detailed evaluation and formal report of all impacts. The damage assessment report will be prepared and submitted to the NJ-OEM and NJ-DSS.

Emergency Notification Directory

1. Dam Owner: _____

Contact Person: _____

Address: _____

Phone No: _____ 24-Hr No: _____

2. Dam Operator: _____

Address: _____

Phone No: _____ 24-Hr No: _____

3. EAP Development Crew

Coordinator: _____

Phone No: _____

Crew

Phone No.

_____	_____
_____	_____
_____	_____

4. Maintenance & Operations Crew

Supervisor: _____

Phone No: _____

Crew

Phone No.

_____	_____
_____	_____
_____	_____

5. Inspectors

Name

Phone No.

_____	_____
_____	_____
_____	_____

VI. Preparedness

6. Owners' Engineers

Name: _____

Contact Person: _____

Address: _____

Phone: _____ 24-Hr No: _____

7. Municipalities

Municipality	Phone No.	Police No.
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

8. Counties

County	Phone No.	Police No.
_____	_____	_____
_____	_____	_____
_____	_____	_____

9. State Agencies

Agency	Phone No.	24-Hr No.
NJ-OEM	(609) 882-4201	(609) 882-2000
NJ-DSS	(609) 984-0859	(877) WARND (877) 927-6337

VI. Preparedness

Emergency Operation Center (EOC)

EOC should be located upstream of the dam.

Address: _____

Direction to the Emergency Operations Center from the nearest State or County highway:

***Include a location map of the Emergency Operations Center.**

VI. Preparedness

EOC Location Map

Refer to Attachment B for a sample EOC location map.

VI. Preparedness

Surveillance Checklist

The surveillance checklist must be specific to the site conditions of the dam and must be prepared by the Owners Engineer.

The surveillance checklist should be utilized by the Inspectors listed on the Emergency Notification Directory during their inspections. A record of these inspections and their findings should be kept by the owner/operator for ready reference.

Refer to Attachment C for a sample surveillance checklist.

VI. Preparedness

List of Contractors

After a situation is identified as an emergency and evaluated, the Chief Executive/Operator is responsible, with assistance from the Owner's Engineer and an approval from the NJ-DSS, to direct repairs to resolve the condition. The severity of the condition will dictate the resources and response time necessary.

It will be the responsibility of the owner to maintain the list of contractors that may be contacted during an emergency condition for equipments, materials, and repairs current.

For each contractor on the list, the following must be provided:

- Contractor name.
- Contact person.
- Address.
- Phone number.
- Scope of its contracted services.

1. Contractor: _____

Contact person: _____ Phone No: _____

Address: _____

Services contracted for: _____

2. Contractor: _____

Contact person: _____ Phone No: _____

Address: _____

Services contracted for: _____

3. Contractor: _____

Contact person: _____ Phone No: _____

Address: _____

Services contracted for: _____

VI. Preparedness

Available On-Site Materials

<u>Material</u>	<u>Location</u>	<u>Quantity</u>
-----------------	-----------------	-----------------

Available On-Site Equipment

<u>Equipment</u>	<u>Location</u>	<u>Quantity</u>
------------------	-----------------	-----------------

VI. Preparedness

Available Off-Site Materials

<u>Material</u>	<u>Company & Location</u>	<u>Phone No.</u>	<u>Approximate Arrival Time to Dam (Min)</u>
-----------------	-------------------------------	------------------	--

Available Off-Site Equipment

<u>Equipment</u>	<u>Company & Location</u>	<u>Phone No.</u>	<u>Approximate Arrival Time to Dam (Min)</u>
------------------	-------------------------------	------------------	--

VII. Inundation Maps

Description of Inundated Area

Index of Maps

List attached maps by name and number:

This section will contain a detailed map of inundated areas, including dwellings if applicable, and the precise location of the dam.

The final inundation map to be included in the EAP should be, whenever possible, no larger than 11 inches by 17 inches, the best available map, and must be a fold out. As such, it may be necessary to reduce the mapping once the inundated areas are identified.

Refer to:

- *Instruction for a detailed inundation map requirements,*
- *Attachment D for a sample inundation mapping, and*
- *Attachment E for guidance in performing the dam breach analysis.*

Appendix A. Plans for Training, Exercising, Updating & Posting

The EAP development coordinator of the dam is responsible for the training, exercising, and updating of the EAP.

Training

The EAP development coordinator of the dam is responsible for the training of all personnel involved in the implementation of the EAP. Training of personnel involved in implementation of the EAP is to ensure that they are thoroughly familiar with all elements of the plan, the availability of material and equipment, and their responsibilities and duties under the EAP.

Technically qualified personnel should be trained in problem detection and evaluation and appropriate remedial (emergency and non-emergency) measures. This training is essential for proper evaluation of developing situations at all levels of responsibility which, initially, is usually based on onsite observations. A sufficient number of personnel should be trained to ensure adequate coverage at all times.

Training courses should be held within two (2) months of the implementation of the EAP. Follow-up training sessions should be held annually. The following should be part of the training:

1. For Normal Operations:
 - Instruction on the location, purpose, and operations of the dam structure components.
 - Demonstration of normal dam conditions and operations.
 - Instruction on visual inspection procedures for the weekly/monthly inspections.
 - Hands-on training of communications equipment.
2. For Emergency Condition Identification:
 - Review of Emergency Action Plan.
 - Instruction on visually detecting an emergency warning sign.
 - Review of conditions which would indicate an emergency including proper identification of the type of emergency.
 - Instruction on interpreting the surveillance checklists to detect an emergency situation.
3. For Emergency Communications:
 - Instruction on proper use of communications equipment.
 - Instruction on appropriate individuals to contact, as well as the time to call them and the order in which calls should be made.
 - Instruction on appropriate message to convey.
4. For Emergency Response Actions:
 - Instruction on the role of each worker in response actions.
 - Instruction on dam emergency response actions to be taken for each type of emergency situation.

Date:_____

VIII. Appendices

Appendix A. Plans for Training, Exercising, Updating & Posting

- Instruction on obtaining and utilizing on and off-site emergency supplies.
- Instruction on determining the end of a dam emergency.
- Instruction on proper communications for notifying the appropriate individuals of the emergency termination.
- Instruction on the appropriate dam emergency recovery activities.

Exercising

Develop scenarios for the various emergency conditions and exercise the state of training and readiness of key personnel responsible for actions during an emergency in order to make sure that they know and understand the procedures to be followed and actions required.

Emergency response exercises should be held annually and should simulate an emergency situation in which the worker is tested on emergency condition notification, emergency communications, and emergency response skills. The exercise, whenever possible, should include participation by both the dam owner and the affected state and local emergency management officials. The exercises should be evaluated both orally and in writing and the EAP should be revised to correct any deficiencies noted.

Updating

The EAP should be updated promptly after each change in involved personnel or their telephone numbers or after the completion of a scheduled exercise review which revealed required changes. A review of the adequacy of the EAP should be conducted at intervals not to exceed one year. If no revision is necessary, a statement that the review was made and no revision to the EAP was necessary should be provided to each recipient of the original EAP.

Posting of the Notification Flowchart

An up-to-date copy of the Notification Flowchart should be posted in prominent locations at the dam site and local emergency operations center (essential for unattended dams).

The flowchart should be posted at each phone and radio transmitter at the dam, powerhouse (if applicable), and at all other desirable locations. The locations of the posted flowcharts should be indicated below.

List of Location of Notification Flowchart at the Dam Site:

Appendix B. Definitions

Definitions

The words and terms listed below, as used in this plan, shall have the following meanings, unless the context clearly indicates otherwise.

Dam - Any artificial dike, levee or other barrier, together with appurtenant works, which is constructed for the purpose of impounding water on a permanent or temporary basis, that raises the water level five (5) feet or more above the usual, mean, low water height when measured from the downstream toe-of-dam to the emergency spillway crest or in the absence of an emergency spillway, the top-of-dam.

Drawdown - Lowering of lake/reservoir level through the use of flood gates, low level outlets, etc.

Emergency - A condition in which a significant hazard to life or property is occurring.

Emergency Action Plan (EAP) - Established procedures necessary to minimize threat to life and damage to property in the event of a dam failure related release.

Emergency Condition - Any of the four conditions identified in the Emergency Condition Identification section.

Emergency Management Service (EMS) - All Offices of Emergency Management (State, County or Local) which would be involved in an emergency response.

Emergency Operation Center (EOC) - The command post from which emergency operations are coordinated. Must contain a telephone/communication line or be close to one.

Failure - An incident resulting in the uncontrolled release of water from an operating dam.

File Number - New Jersey State identification number for the dam.

Hazard Classification - Classification of potential hazard a dam failure would cause downstream of the dam.

Class I (High Hazard Potential) - Those dams the failure of which may cause the probable loss of life or extensive property damage.

Class II (Significant Hazard Potential) - Those dams the failure of which may cause significant damage to property and project operation, but loss of human life is not envisioned.

Inundation - The area that would be directly affected by flood waters resulting from a catastrophic dam failure.

VIII. Appendices

Appendix B. Definitions

Large Dam - A dam which raises the water of any stream more than 70 feet above its usual mean low-water height or which impound more than 10,000 acre-feet of water.

NJ-DSS - New Jersey Department of Environmental Protection, Dam Safety Section.

NJ File No. - New Jersey State identification number for the dam.

NJ-OEM - New Jersey State Police, Office of Emergency Management.

Outlet - An opening through which water can be freely discharged from a lake/reservoir for a particular purpose.

Owner/Operator - Person/entity who owns, controls, operates, maintains, manages the dam.

Piping - The progressive development of internal erosion by seepage, appearing downstream as a hole or seam discharging water that contains soil particles.

Sinkhole - Any unusual subsidence.

Slumping - The movement of a mass of earth and/or down a slope. In embankments and abutments, this involves the separation of a portion of the slope from the surrounding material.

Spillway - A waterway/structure designed to convey excess water from a reservoir/lake without endangering the safety of the dam.

Spillway Design Flood - The flood associated with the spillway design storm upon which the hydraulic capacity of the spillway structure is designed.

Appendix C. Approval & Distribution of the EAP

Approval and Distribution

Once the EAP has been developed, the owner/operator shall submit the completed EAP with inundation mapping and dam breach analyses to the NJ-DSS for review and approval. Once the NJ-DSS approves the EAP, the EAP must be distributed by the owner to all individuals who will be involved during an emergency. Any revisions to the EAP should be furnished to all individuals to whom the original EAP was distributed.

Each party receiving an EAP must sign and return a receipt to the distributor (owner/operator) of the EAP. The signed receipt should help to assure that all parties are aware of and understand the EAP and agree to their assigned roles should an emergency occur.

A standard distribution letter and receipt is included for reference.

VIII. Appendices

Appendix C. Approval & Distribution of the EAP

Document Distribution

The document holder and location of each copy of the up-to-date EAP should be included in this section of the EAP.

Controlled Document Holder

Document Number

NJ-OEM (State Police OEM)

NJ-DSS (DEP Dam Safety Section)

Appendix C. Approval & Distribution of the EAP

Standard Distribution Letter & Receipt

(Date)

(Name of EAP document holder)
(Company or affiliation)
(mailing address)

Re: EAP for (name of dam) Dam
NJ File No. (NJ File No.)

Dear (Name of EAP holder):

(Name of the owner/operator or their group) has (prepared or revised) the Emergency Action Plan for (name of the dam) Dam located within (name of township), (name of county) County. The EAP is a public safety regulatory required document. The (year) revisions are described in the REVISION SUMMARY.

Please insert the new material with the revision date in your controlled copy and remove the obsolete material (the effective dates generally are printed at the lower right corner of the pages). Please acknowledge your receipt of your controlled copy distribution by returning the obsolete pages to the undersigned with the attached acknowledgment, signed and dated.

We appreciate your continued cooperation in the revisions of the EAP. Should you have any recommendations or questions regarding the EAP, please do not hesitate to contact the undersigned.

Sincerely,

(Your name),
(Affiliation)

I acknowledge receipt of the (revision date) revision to the (name of dam) EAP and have inserted the revision pages in my controlled copy. This EAP will be maintained at the designated location for use in the event of a drill or actual emergency declaration.

Controlled Document holder name: _____ Document No: _____

Signature: _____ Date: _____

Attachment B

Sample - Emergency Operations Center (EOC) Location Map

*** Please refer to the hard copy for a sample EOC location map.**

Attachment C

Sample - Surveillance Checklist

***Please refer to the hard copy for a sample Surveillance Checklist.**

Attachment D

SAMPLE INUNDATION MAPPING

[To be provided at a later date]

Attachment E

Guidelines For Dam Breach Analyses

Dam breach analyses are required for Class I and Class II dams to determine the inundation area downstream of dams. Dam breach analyses are also required with reclassification requests. The following is a summary of information that must be submitted, as a minimum, to NJ-DSS for review:

- Normal pool, sunny day dam breach analysis.
- Spillway design flood analysis without a dam breach.
- Spillway design flood analysis with a dam breach.
- If appropriate, domino effect analysis (multiple dam failures of downstream structures).
- All supporting calculations and documentation for the studies.
- Justification for any assumptions.
- Description of any special conditions.
- ***For Class I large dams, non-failure flood analysis resulting from gate malfunction or some other malfunction at the dam which would cause flooding downstream.***

Attached Table 1 gives suggested dam breach parameters recommended by the Federal Energy Regulatory Commission. The owner/operator's engineer is advised to keep the following items in mind when utilizing Table 1 and modeling dam breach analyses:

- BR is the average breach width, which is not necessarily the bottom width. BR is the bottom width for a rectangle, but BR is not the bottom width for a trapezoid.
- Whether the shape is rectangular, trapezoidal, or triangular is not generally critical if the average breach width for each shape is the same. What is critical is the assumed average width

of the breach.

- Time to failure is a function of height and type of dam and location of breach. Therefore, the longer the time to failure, the wider the breach should be. Also, the greater the height of the dam and the storage volume, the greater the time to failure and average breach will probably be.
- The bottom of the breach should be at the foundation elevation.
- Breach width assumptions should be based on the height and the type of the dam, the volume of the reservoir, and the type of failure (e.g. piping, sustained overtopping, etc.).
- For a worst case scenario, the average breach width should be in the upper portion of the recommended range, the time to failure should be in the lower portion of recommended range, and the manning's " n " value should be in the upper portion of the recommended range. If a worst case scenario is not used, a sensitivity analysis should be performed to fully investigate the impacts of a failure on downstream areas since the actual breach parameters will not be known. The sensitivity analysis will provide an estimate of the confidence limits and relative differences resulting from varying failure assumptions.
- To compare relative differences in peak elevation based on variations in breach widths, the sensitivity analysis should be based on the following assumptions:
 - Assume a probable (reasonable) maximum breach width, a probable minimum time to failure, and a probable maximum manning's n value. Manning's n values in the vicinity of the dam (up to several thousand feet or more downstream) should be assumed to be larger than the maximum value suggested by field investigations in order to account for uncertainties of high energy losses, velocities, turbulence, etc., resulting from the initial failure.
 - Assume a probable minimum breach width, a probable maximum time to failure, and a probable minimum manning's n value.
- To compare differences in travel time of the flood wave, the sensitivity analysis should be based on the following assumptions:
 - Assume a probable maximum breach width, a probable minimum time to failure, and a probable maximum manning's n value. Manning's n values in the vicinity of the dam (up to several thousand feet or more downstream) should be assumed to be larger than the maximum value suggested by field investigations in order to account for uncertainties of high energy losses, velocities, turbulence, etc., resulting from the initial failure.
 - Assume a probable maximum breach width, a probable minimum time to failure, and a probable minimum manning's n value.

- To compare differences in elevation between natural flood conditions and natural flood conditions plus dambreak, the sensitivity analysis should be based on the following assumptions:
 - Route the natural flood without dambreak assuming a maximum probable manning's n value.
 - Assume a probable maximum breach width, a probable minimum time to failure, and a probable maximum manning's n value. Manning's n values in the vicinity of the dam (up to several thousand feet) should be assumed to be larger than the maximum value suggested by field investigations in order to account for uncertainties of high energy losses, velocities, turbulence, etc., resulting from the initial failure.
- Investigations under both normal and flood flow conditions should be considered, as appropriate.
- When dams are assumed to fail from overtopping, wider breach widths than those suggested on Table 1 should be considered if overtopping is sustained for a long period of time.

In special circumstances, dam breach analysis may not be necessary. However, these cases are rare. If the owner/operator's engineer feels there is sufficient evidence or justification for not performing the dam breach analysis, this information must be submitted to the NJ-DSS for consideration.

TABLE 1
(Suggested Breach Parameters)

Parameter	Value	Type of Dam
Average width of breach (BR)	BR = Crest Length	Arch
	BR = Width of 1 or more monoliths (usually $BR \leq 0.5W$)	Masonry, Gravity
	$HD \leq BR \leq 5HD$ (usually between 2HD & 4HD)	Earthen, Rockfill
	$BR \geq 0.8 \times \text{Crest Length}$	Timber Crib Slag, Refuse
Horizontal component of side slope of breach (Z)	$0 \leq Z \leq \text{slope of valley walls}$	Arch
	$Z = 0$	Masonry, Gravity, Timber Crib
	$1/4 \leq Z \leq 1$	Earthen (engineered, compacted)
	$1 \leq Z \leq 2$	Slag, Refuse (non-engineered)
Time to failure (TFH) in hours		
	$TFH \leq 0.1$	Arch
	$0.1 \leq TFH \leq 0.3$	Masonry, Gravity
	$0.1 \leq TFH \leq 1.0$	Earthen (engineered, compacted) Timber Crib
	$0.1 \leq TFH \leq 0.5$	Earthen (non-engineered, poor construction)
	$0.1 \leq TFH \leq 0.3$	Slag, Refuse

Definition: (See Figure 1 for definition sketch)

HD - height of dam

Z - horizontal component of side slope of breach

BR - average width of breach

TFH - time to fully form the breach

W - crest length

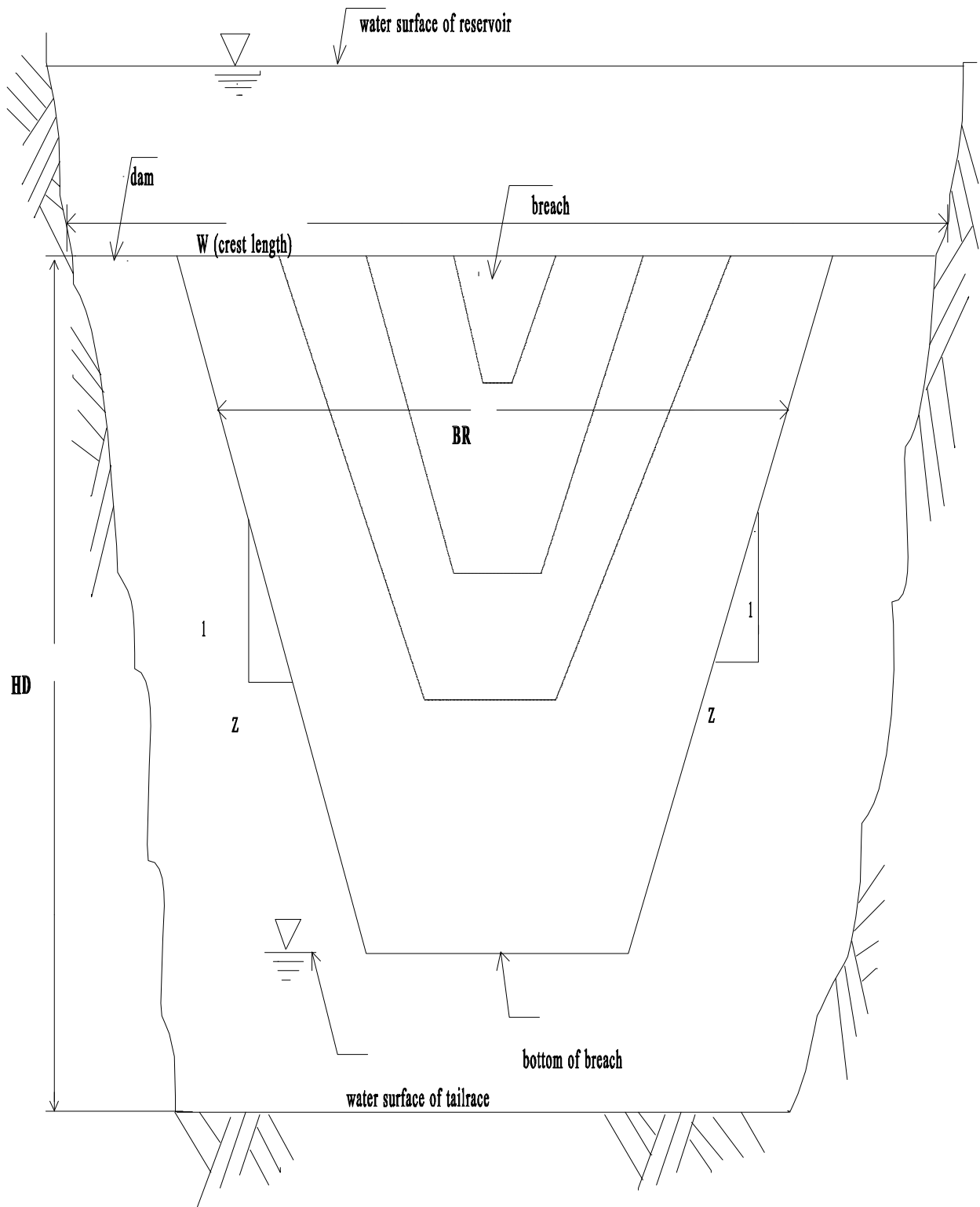


FIGURE 1. DEFINITION SKETCH OF BREACH PARAMETERS

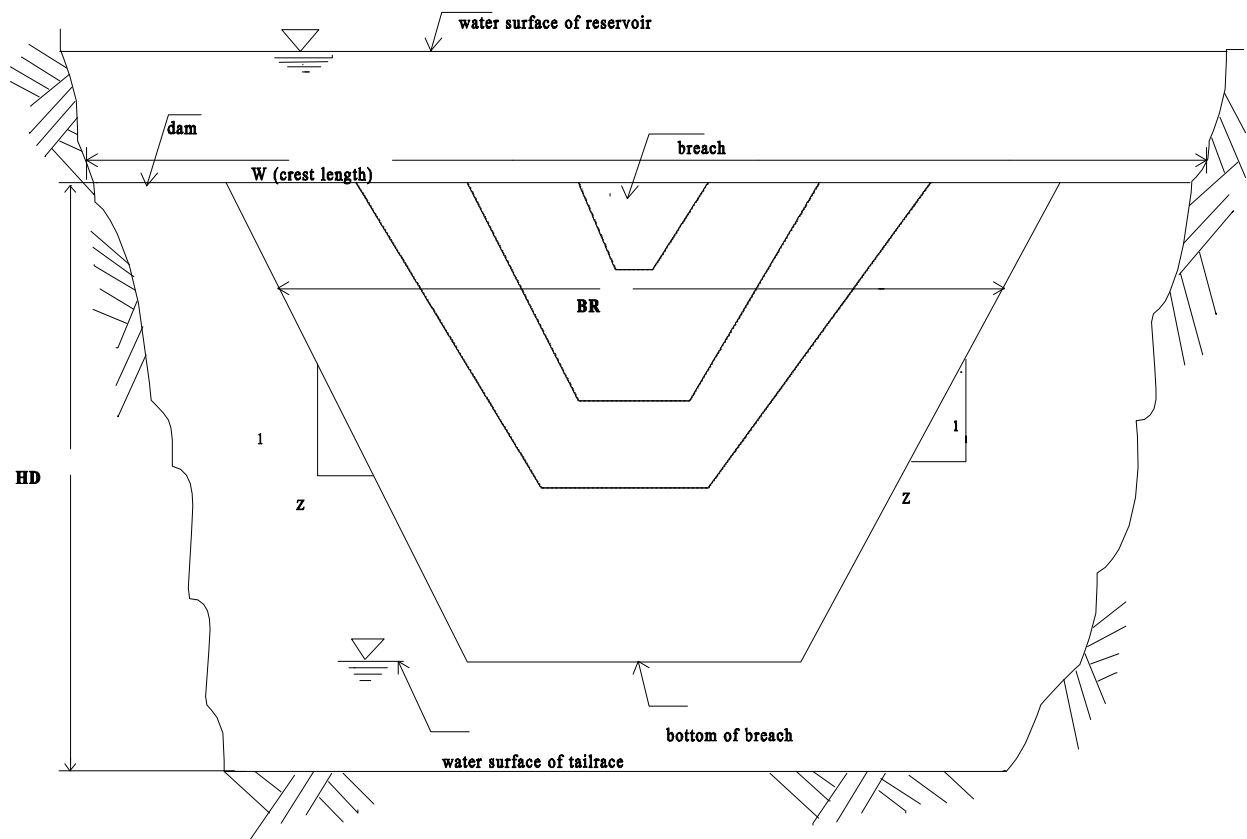


FIGURE 1. DEFINITION SKETCH OF BREACH PARAMETERS